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# Emergency medicine updates: Upper gastrointestinal bleeding

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ABSTRACT

*Introduction:* Upper gastrointestinal bleeding (UGIB) is a condition commonly seen in the emergency department (ED). Therefore, it is important for emergency clinicians to be aware of the current evidence regarding the diagnosis and management of this disease.
*Objective:* This paper evaluates key evidence-based updates concerning UGIB for the emergency clinician.
*Discussion:* UGIB most frequently presents with hematemesis. There are numerous causes, with the most common peptic ulcer disease, though variceal bleeding in particular can be severe. Nasogastric tube lavage for diagnosis is not recommended based on the current evidence. A hemoglobin transfusion threshold of 7 g/dL is recommended (8 g/dL in those with myocardial ischemia), but patients with severe bleeding and hemodynamic instability require emergent transfusion regardless of their level. Medications that may be used in UGIB include proton pump inhibitors, prokinetic agents, and vasoactive medications. Antibiotics are recommended for those with cirrhosis and suspected variceal bleeding. Endoscopy is the diagnostic and therapeutic modality of choice and should be performed within 24 h of presentation in non-variceal bleeding after resuscitation, though patients with variceal bleeding may require endoscopy within 12 h. Transcatheter arterial embolization or surgical intervention may be necessary. Intubation should be avoided if possible. If intubation is necessary, several considerations are required, including resuscitation prior to induction, utilizing preoxygenation and appropriate suction, and administering a prokinetic agent. There are a variety of tools available for risk stratification, including the Glasgow Blatchford Score.
*Conclusions:* An understanding of literature updates can improve the ED care of patients with UGIB.
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## 1. Introduction

Acute upper gastrointestinal bleeding (UGIB), defined as bleeding above the ligament of Treitz (i.e., esophagus, stomach, proximal small intestine), is a common reason for presentation to the emergency department (ED) [1-5]. UGIB has an incidence of 48–160 per 100,000 persons and over 250,000 admissions annually, with men affected more commonly than women [1-11]. It is more common than lower GI bleeding, accounting for approximately 75% of all acute GI bleeding patients [1,2,4,11-16]. UGIB is also associated with a sixfold increased rate of admission and higher mortality (2–15%) compared to lower GI bleeding [1,2,4,12-16].

There are a variety of UGIB etiologies, including esophagitis, esophageal varices, peptic ulcer disease, gastritis, duodenitis, Mallory-Weiss tear, and vascular malformations (Table 1). Bleeding from a peptic ulcer is most common overall (40–50%), but bleeding in those with esophageal varices in particular can be severe [1-4,8-11]. There are multiple risk factors for developing a new UGIB, including prior UGIB, anticoagulant use, nonsteroidal anti-inflammatory drug (NSAID) use, older age, *Helicobacter pylori* infection, and renal disease [2,7,9-12,16]. Patients can present with a spectrum of symptoms, ranging from mild hematemesis to syncope and airway compromise resulting from severe hemorrhage. However, hematemesis with fresh blood or clots is highly suggestive of moderate to severe bleeding [9-11,14]. Patients may also present with melena, coffee-ground emesis, or even hematochezia in those with severe UGIB [9-11,13,14]. The following questions will highlight several key updates in the diagnosis and management of UGIB, but this paper is not intended to serve as a review of the condition in its entirety.

## 2. Discussion

### 2.1. Is nasogastric tube lavage recommended to determine the source of bleeding?

Nasogastric tube (NGT) lavage has been previously utilized to assist in differentiating an upper versus lower source of GI bleeding. NGT

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**Table 1**
Etiologies of upper gastrointestinal bleeding.

| Etiology | Features | Risk factors |
|---|---|---|
| Duodenal/gastric ulcer | Hematemesis, melena, hematochezia, upper abdominal pain, pain with eating (worse with eating – gastric, improved with eating – duodenal) | Infection (*H. pylori*, CMV, HSV), NSAID use, stress ulcer, idiopathic |
| Esophagitis | Hematemesis, melena, hematochezia, dysphagia, odynophagia, retrosternal pain | GERD, medications (e.g., doxycycline/tetracycline, clindamycin, NSAIDs, bisphosphonates, potassium chloride, iron, quinidine), infections (HSV, CMV, HIV, Candida) |
| Gastritis/duodenitis | Hematemesis, melena, dyspepsia | Excessive alcohol, *H. pylori*, NSAIDs, radiation, stress, anticoagulant use |
| Esophageal or ectopic varices | Hematemesis, melena, hematochezia, portal hypertension (splenomegaly, ascites), altered mental status, may be hemodynamically unstable. | Cirrhosis, portal vein thrombosis, portal hypertension |
| Portal hypertensive gastropathy | Hematemesis, melena, hematochezia, portal hypertension (splenomegaly, ascites) | Cirrhosis, portal vein thrombosis, portal hypertension |
| Angiodysplasia | Hematemesis, melena, hematochezia | End stage renal disease, aortic stenosis, left ventricular assist device, von Willebrand disease, hereditary hemorrhagic telangiectasia, radiation |
| Dieulafoy's lesion | Hematemesis, melena, hematochezia | Unknown etiology; may be associated with cardiovascular disease, hypertension, NSAIDs, kidney disease, diabetes, alcohol |
| Gastric antral vascular ectasia | Hematemesis, melena, hematochezia, stigmata of liver disease | Cirrhosis, kidney disease, diabetes, systemic sclerosis, bone marrow transplantation |
| Blue rubber bleb nevus syndrome | Hematemesis, melena, hematochezia, venous malformation/hemangioma of other systems (skin, liver, muscles, central nervous system) | |
| Mallory-Weiss syndrome | Hematemesis after increased intraabdominal pressure, melena, hematochezia, epigastric and/or back pain | Vomiting/retching, straining with lifting or bowel movement, coughing, seizures, blunt abdominal trauma, hiatal hernia |
| Foreign body ingestion | Hematemesis, melena, hematochezia, dysphagia/odynophagia, neck or abdominal pain, choking, hypersalivation | Psychiatric disorders, altered mental status, loose dentures |
| Post-surgical anastomotic bleeding | Hematemesis, melena, hematochezia, epigastric pain, náusea, vomiting | Billroth II surgery, gastric by-pass surgery, *H. pylori* infection, NSAIDs, smoking |
| Post-polypectomy, endoscopic resection or sphincterotomy | Hematemesis, melena, hematochezia, epigastric pain, history of instrumentation (up to 3 weeks prior to symptoms) | Large lesions |
| Cameron lesions | Hematemesis, melena, hematochezia | Hiatal hernia, reflux esophagitis |
| Aortoenteric fistula | Hematemesis, melena, hematochezia, may have herald bleed followed by massive bleeding, fever, back pain, sepsis, pulsatile, abdominal pass | Aortitis, prosthetic aortic graft, aortic aneurysm, penetrating ulcer or tumor, trauma, radiation, foreign body perforation |
| Upper GI tumor | Hematemesis, melena, hematochezia, weight loss, anorexia, epigastric pain, early satiety, nausea/vomiting, palpable mass, dysphagia | Benign (leiomyoma, lipoma, polyp) or malignant (adenocarcinoma, GI stromal tumor, lymphoma, Kaposi sarcoma, carcinoid, melanoma, metastatic) |
| Hemosuccus pancreaticus | Hematemesis, melena, hematochezia, abdominal pain similar to pancreatitis, jaundice, weight loss | Pancreatitis, arterial aneurysm, tumor, iatrogenic, infection, congenital anomaly |
| Hemobilia | Hematemesis, melena, hematochezia, biliary colic, jaundice, sepsis | History of liver/biliary injury or instrumentation |

CMV – cytomegalovirus, EBV – Epstein Barr virus, GERD – gastroesophageal reflux disease, HIV – human immunodeficiency virus, HSV – herpes simplex virus, NSAIDs – nonsteroidal anti-inflammatory drugs.

lavage with red blood or coffee ground appearing material may confirm an UGIB, and it can also suggest continued bleeding from an upper GI source [9-11,17-25]. However, NGT lavage can be negative if there is no continued bleeding or if the source of bleeding is distal to the pylorus, and it is associated with significant discomfort and risk of epistaxis and placement failure [10,24]. More recent data suggest NGT lavage does not assist in differentiating UGIB and lower GI bleeding [22,23], and a randomized controlled trial (RCT) found that NGT lavage was not associated with improved prediction of a high risk lesion needing endoscopic management [24]. Importantly, data also do not demonstrate a benefit in patient-centered outcomes with NGT lavage. Prospective and retrospective studies evaluating NGT lavage in those with GI bleeding have not found a difference in mortality, hospital length of stay (LOS), need for surgery, or transfusion, though there may be a shorter time to endoscopy [10,17-25]. Based on the current evidence, NGT lavage should not be used routinely to determine a bleeding source, though it may be used to aspirate material from the stomach to assist with endoscopy and if endotracheal intubation is necessary [10,18,20,21].

### *2.2. When should blood products be administered?*

Patients with massive hemorrhage and hemodynamic instability should receive blood product transfusion with whole blood (if available), followed by transfusion of packed red blood cells (pRBCs), platelets, and fresh frozen plasma (FFP) in a 1:1:1 ratio. Massive transfusion protocol may be necessary, along with administration of calcium. However, in otherwise stable patients, clinicians should use a more conservative hemoglobin transfusion threshold of 7 g/dL [9-11]. A threshold of ≥8 g/dL may be utilized in those with existing cardiovascular disease [9-11]. This transfusion threshold is recommended by the American College of Gastroenterology (ACG), the European Society of Gastrointestinal Endoscopy (ESGE), and the Association for the Advancement of Blood and Biotherapies [9,10,26].

These thresholds are based on several RCTs and systematic reviews. One of the largest RCTs including patients with GI bleeding compared 7 g/dL and 9 g/dL hemoglobin transfusion thresholds in 899 patients but excluded those with massive hemorrhage [27]. Authors found reduced transfusion (49% vs. 86%) and lower mortality (5% vs. 9%) in the patients randomized to the 7 g/dL transfusion threshold group. They also found reduced bleeding (10% vs. 16%), fewer cardiac complications (11% vs. 16%), and fewer transfusion reactions (3% vs. 9%) [27]. A meta-analysis including 1965 patients found reduced transfusion (mean difference − 1.73 units), all-cause mortality (relative risk 0.65), and rebleeding (relative risk 0.58) using restrictive transfusion threshold in both variceal and non-variceal UGIB [28]. A 2021 meta-analysis evaluating transfusion thresholds for all types of bleeding (GI, surgery, critical care) found no difference in 30-day mortality with restrictive transfusion strategy compared to a liberal transfusion strategy (risk ratio 0.99, 95% confidence interval [CI] 0.86–1.15), but there were fewer pRBC transfusions in the restrictive transfusion strategy [29]. Of note, over resuscitation is not recommended, particularly in patients

with cirrhosis and suspected variceal bleeding. In these patients, transfusion should be based on the patient's baseline blood pressures and markers of perfusion (e.g., mental status, capillary refill, heart rate) [30,31].

Patients with severe bleeding or critical illness and a platelet count <50,000 cells/mm$^3$ should receive platelet transfusion, though platelet transfusion is not recommended as a reversal option for those who are on antiplatelet agents [9,11]. In those receiving anticoagulation (e.g., warfarin, direct oral anticoagulants [DOACs]), reversal is necessary if there is severe bleeding [9,10]. This should consist of vitamin K and prothrombin complex concentrates (PCC) or FFP for warfarin; for DOACs this may include either PCC or a DOAC-specific reversal agent [32-40]. Data suggest that endoscopy is likely safe for patients with thrombocytopenia [41]. The ACG, ESGE, and International Consensus Group (ICG) all recommend not delaying endoscopy for reversal of anticoagulation [9-11,32].

Tranexamic acid (TXA) is an antifibrinolytic agent that has demonstrated utility in select conditions associated with hemorrhage (e.g., trauma) [42-44]. However, in patients with UGIB, TXA is likely not effective based on current literature. The highest quality evidence concerning TXA use in UGIB includes the HALT-IT trial, published in 2020 [45]. This RCT included over 12,000 patients with UGIB and found no reduction in death due to bleeding within 5 days (risk ratio 0.99, 95% CI 0.82–1.18) with TXA administration, but TXA was associated with increased venous thromboembolic events (VTE) (risk ratio 1.85, 95% CI 1.15–2.98) and seizures (1.73, 95% CI 1.03–2.93) [45]. Based on the available evidence, the ACG and ESGE recommend against using TXA in those with UGIB [9,10].

### 2.3. What medications should be administered in the ED setting?

#### 2.3.1. Proton pump inhibitors

Gastric acid suppression, most commonly with a proton pump inhibitor (PPI), is often utilized in those with UGIB. In patients with UGIB due to peptic ulcer disease, PPIs may neutralize gastric acid and stabilize blood clots, as well as reduce the prevalence of endoscopic bleeding stigmata [2,4,5,9-11]. However, the evidence concerning PPI use in all patients with UGIB is controversial, with no improvement in patient-oriented outcomes. A Cochrane review of 21 RCTs including patients with endoscopically confirmed peptic ulcer bleeding found PPI therapy reduced rebleeding (number-needed-to-treat [NNT] 15), surgical intervention (NNT 32), and repeat endoscopy (NNT), with no reduction in mortality overall [46]. In all patients with undifferentiated UGIB, a Cochrane review of 6 RCTs evaluating use of PPIs, H2-receptor antagonists, or no treatment prior to endoscopy found no reduction in mortality, risk of rebleeding, or need for surgery [47]. However, authors found a reduction in secondary outcomes including stigmata of recent hemorrhage (odds ratio [OR] 0.67, 95% CI 0.54–0.84, NNT 11) with PPI compared to control and reduced need for endoscopic therapy at the index visit (OR 0.68, 95% CI 0.50–0.93, NNT 33) [47].

PPI dosing for UGIB most commonly includes either pantoprazole or omeprazole 80 mg intravenous (IV) bolus followed by 8 mg/h or pantoprazole or omeprazole 40–80 mg IV twice per day. Current evidence suggests no difference in outcomes between these dosing regimens [48-50]. A Cochrane review published in 2013 including 22 RCTs evaluated high-dose bolus PPI therapy with continuous infusion compared to lower doses administered by continuous infusion, IV bolus, or orally after endoscopy for peptic ulcer bleeding found no difference in mortality, rebleeding, surgery, hospital LOS, or blood transfusion [48]. A 2014 meta-analysis including 13 studies comparing continuous infusion PPI versus intermittent dosing in those with UGIB from high-risk peptic ulcer after endoscopy found intermittent dosing was noninferior in terms of rebleeding in 7–30 days, mortality, need for intervention, need for blood transfusion, or hospital LOS [49].

Due to the lack of improvement in patient-oriented outcomes such as mortality, recurrent hemorrhage, or need for surgery [47], the ACG does not make a recommendation for or against pre-endoscopic PPI therapy [9]. However, post-endoscopic PPI therapy may reduce risk of rebleeding in those with confirmed peptic ulcers and high risk of bleeding [9,51,52]. Thus, the ACG states that PPI therapy may have a benefit in a minority of patients with UGIB due to peptic ulcer disease and that a PPI may be given based on indirect evidence [9]. They also state use of a PPI may be considered in patients who will not undergo endoscopy or in whom endoscopy will be delayed [9]. The ESGE suggests that high-dose PPI administration in those with acute UGIB may be considered to reduce the risk of bleeding stigmata and need for endoscopic therapy despite the absence of improvement in patient-oriented outcomes [10]. The ESGE guidelines also recommend high dose PPI therapy for patients who receive endoscopic hemostasis [10].

Based on the available evidence, PPIs may assist in those with confirmed peptic ulcer disease after endoscopy by reducing rebleeding and need for surgical intervention or repeat endoscopy, but they are not associated with improved outcomes in other patients with UGIB. If a PPI is administered, we recommend pantoprazole or omeprazole 40–80 mg IV every 12 h, rather than 80 mg IV bolus and 8 mg/h IV infusion, as bolus dosing does not require the continuous use of an IV access site [48-50,53,54]. Of note, H2-receptor antagonists do not demonstrate efficacy in acute UGIB and are not currently recommended [9-11].

#### 2.3.2. Prokinetic agents

Prokinetic agents (e.g., erythromycin, metoclopramide) promote gastric emptying and may clear the stomach of blood and clots, thereby improving endoscopic visualization and diagnostic yield [9-11]. Several RCTs and meta-analyses have evaluated erythromycin. A 2016 meta-analysis with 8 RCTs evaluated erythromycin prior to endoscopy in those with UGIB. Erythromycin improved visualization (OR 4.14, 95% CI 2.01–8.53, NNT 4), reduced the need for second endoscopy (OR 0.51, 95% CI 0.34–0.77, NNT 9), and reduced the hospital LOS (−1.75 days; 95% CI -2.43 to −1.06) [55]. However, there was no difference in need for emergent surgery or amount of blood transfused. A Cochrane review published in 2023 including 11 RCTs found similar results with improved visualization in patients receiving erythromycin (mean difference 3.63 points on 16-point ordinal scale, 95% CI 2.20–5.05), but no difference in non-serious and serious adverse events, all-cause mortality, and rebleeding [56]. The 2021 ACG guidelines suggest administering erythromycin prior to endoscopy, while the 2021 ESGE guidelines recommend erythromycin only in those with clinically severe or continued, active UGIB prior to endoscopy [9,10]. Erythromycin dosing is 250 mg IV over 5–30 min, with endoscopy 20–90 min following the infusion [9,10]. Older studies found no consistent, definitive benefit with metoclopramide 10–20 mg IV, and thus the ACG does not currently recommend its use to improve visualization prior to endoscopy [9]. However, one study of 52 patients published in 2019 found improved fundal visualization with metoclopramide in non-ulcer cases of UGIB [57]. An RCT of 68 patients comparing metoclopramide versus placebo found metoclopramide was associated with improved rates of adequate visualization (OR 13, 95% CI 1.32–128.10) and endoscopic visualized gastroduodenal scores and reduced need for second look endoscopy (OR 0.11, 95% CI 0.01–0.99) [58]. Based on the available evidence, erythromycin or metoclopramide may be administered 20–90 min prior to upper endoscopy in conjunction with GI specialist discussion, as these prokinetic agents may assist in gastric emptying and improve the diagnostic and therapeutic capabilities of endoscopy. However, prokinetic agents should not be administered routinely in all patients with UGIB.

#### 2.3.3. Somatostatin analogues

Octreotide is a somatostatin analogue that reduces splanchnic blood flow and portal pressures and thus is often utilized in patients with variceal UGIB, though the current literature is controversial [9,10,30,31,59]. A Cochrane review including 21 RCTs of patients with UGIB from esophageal varices found no reduction in all-cause mortality

or risk of rebleeding; however, there was a reduction in the amount of blood products transfused by 0.7 units [59]. It has not demonstrated any benefit in patients with UGIB from other causes. Thus, while it is not universally recommended for all patients with UGIB, it may be considered in situations where the patient is hemodynamically unstable or if endoscopy is not available, specifically in those with variceal UGIB [9,10]. Dosing of octreotide includes a 50 microgram IV bolus followed by an infusion of 50 micrograms per hour [30,31].

#### 2.3.4. Antibiotics

IV antibiotics should be utilized in a select subset of patients with UGIB. A Cochrane review of 12 studies (1241 patients) of patients with cirrhosis and UGIB found improved survival and significant reduction in infections such as nosocomial bacteremia, pneumonia, spontaneous bacterial peritonitis, and urinary tract infection [60]. Authors found a NNT of 22 for reduced mortality and a NNT of 4 to prevent infection [60]. This effect on mortality was severity-dependent, with more critically ill patients demonstrating the greatest reduction in mortality with antibiotics [60]. There may also be reduced risk of recurrent bleeding in hospitalized patients with cirrhosis and UGIB from esophageal varices [9]. Thus, based on the available evidence, antibiotics such as ceftriaxone 1 g IV should be administered in patients with cirrhosis and UGIB [30,31,60].

### 2.4. When is endoscopy recommended?

Upper GI endoscopy is a key diagnostic modality with high sensitivity and specificity for diagnosing the source of bleeding [2,4,5,9-11]. Endoscopy is also integral to achieving hemostasis and preventing rebleeding [2,4,5,9-11]. Thus, consultation with a GI specialist is recommended for all admitted patients with acute UGIB [2,4,5,9-11]. However, there are risks of endoscopy including aspiration, GI perforation, increased bleeding, and adverse events to sedation [2,9,10,61-70]. Current data suggest endoscopy within 24 h is associated with reduced in-hospital mortality, shorter LOS, and reduced costs in those with non-variceal UGIB [62-65,71-73]. Endoscopy within 12 h has demonstrated conflicting results [9,10,61,74,75]. A 2020 study evaluated endoscopy within 6 h of GI specialist consultation compared with endoscopy within 24 h in those with acute UGIB, hemodynamic stability, and Glasgow Blatchford score (GBS) ≥ 12 [61]. They found no difference in mortality, though only a quarter of patients underwent endoscopy within 6 h, and there were no patients who were hemodynamically unstable [61]. Another RCT evaluating endoscopy within 12 h compared with after 12 h for those with UGIB due to confirmed bleeding ulcer found no decrease in bleeding or mortality with endoscopy within 12 h [66]. A large prospective study with 12,601 patients with UGIB associated with peptic ulcers found higher in-hospital and 30-day mortality in patients undergoing endoscopy within 6 h, particularly in those who were hemodynamically unstable or had an American Society of Anesthesiologists score ≥ 3 [69]. The data concerning variceal UGIB differ from patients with non-variceal UGIB. A meta-analysis of 9 studies found patients with variceal UGIB undergoing early endoscopy within 12 h had reduced mortality compared to delayed endoscopy after 12 h, with no difference in rebleeding [70].

Importantly, the 2021 ACG guidelines recommend performing endoscopy within 24 h of admission or patient presentation in patients with non-variceal bleeding who are hemodynamically stable, and the ESGE guidelines and ICG recommend performing endoscopy within 24 h but after resuscitation in those with non-variceal bleeding [9-11]. Both the ACG and ESGE guidelines do not recommend urgent endoscopy (≤12 h) in patients with non-variceal UGIB, as there is no improvement in patient-centered outcomes [9,10]. Guidelines stress the need for resuscitation prior to endoscopy, though the ICG does not make a recommendation before or against endoscopy within 12 h in those with non-variceal bleeding [9-11]. The guidelines for those with variceal bleeding differ as these patients should undergo endoscopic evaluation within 12 h [9,10,76,77]. In patients with variceal bleeding, guidelines recommend endoscopy as soon as possible after resuscitation [76,77].

These data and guidelines suggest that while endoscopy should be obtained within 24 h in those with non-variceal UGIB, emergent resuscitation prior to endoscopy is necessary, along with GI consultation in the ED [9,10]. In those with variceal bleeding, endoscopy within 12 h (or sooner) is recommended after resuscitation [76]. While this resuscitation is essential, a normal hemoglobin or platelet count is not necessary prior to endoscopy [78]. The use of antiplatelet agents, anticoagulants, or a defined international normalized ratio (INR) threshold should not be used as contraindications for endoscopy [9,10].

### 2.5. What are other interventions beyond endoscopy?

For patients with UGIB who fail other therapies including endoscopy, particularly in those with peptic ulcer disease, transcatheter arterial embolization (TAE) or surgery may be necessary [2,5,9,10]. A meta-analysis including 13 studies comparing TAE versus surgery in patients with UGIB who failed endoscopy found no difference in mortality (OR 0.77, 95% CI 0.50–1.18), but fewer major complications (OR 0.45, 95% CI 0.30–0.67) and reduced LOS (8 vs. 16 days) in TAE; however, there was a higher risk of bleeding with TAE (OR 2.44, 95% CI 1.77–3.36) [79]. Based on these data, TAE is a viable option for control of UGIB. However, this is based on the local setting and institution. If interventional radiology is available, the emergency clinician should consult both interventional radiology and the surgical specialist, as the specific modality requires consideration of the hemodynamic status, local expertise, and patient comorbidities. If TAE is an option, computed tomography with angiography is recommended to assist with localization of the bleeding [9,10,79-83]. With appropriate localization, TAE is successful in approximately 95% of patients [79-83].

For patients with variceal bleeding who continue bleeding despite medical therapy while waiting endoscopy, a balloon tamponade device may be utilized [76,84,85]. This can achieve short-term hemorrhage control but is associated with complications and risk of rebleeding when the balloon is deflated. There are three balloon tamponade devices: Sengstaken-Blakemore tube (with a gastric and esophageal balloon and single gastric suction port), Minnesota tube (gastric and esophageal balloon with esophageal and gastric suction ports), and Linton-Nachlas tube (gastric balloon) [84,85]. Balloon tamponade devices are effective in 30–90% of patients with variceal bleeding [84-87]. Patients should be intubated prior to balloon placement. Following placement, the tamponade device can remain in place for 24 h, though the gastric balloon will need to be deflated every 12 h to assess for rebleeding [76]. If bleeding recurs upon deflation, the balloon can be reinflated. Importantly, this is only a temporizing measure, and relative contraindications include recent esophageal or gastric surgery and esophageal stricture [84,88]. Transjugular intrahepatic portosystemic shunt (TIPS) is a treatment option for patients with severe, continued variceal bleeding and functions as a surgical portacaval shunt [30,76,89]. This modality has a 90–100% success rate in achieving hemostasis, though it can increase the risk of encephalopathy [30].

### 2.6. What airway considerations are necessary in those with UGIB?

Endotracheal intubation in the patient with UGIB can be challenging and is associated with significant risk. The clinician must be able to manage complications including a view obscured by blood or vomit, the risk of aspiration, hemodynamic instability, comorbidities, and blood or body fluid exposure. Endotracheal intubation should be avoided if possible, as prophylactic intubation in patients with UGIB is associated with greater risk of mortality, pneumonia, hospital LOS, and cost [90-93]. The ESGE recommends against routine endotracheal intubation prior to upper endoscopy [10]. However, a select subset of patients will require endotracheal intubation, including those with a decreasing level of

**Table 2**
Approach for endotracheal intubation in those with UGIB.

- All staff in appropriate PPE (eye protection, mask, gown, gloves)
- Preoxygenate
- Manage any hemodynamic instability prior to induction and prevent further decline during intubation: multiple points of vascular access, blood product transfusion, peripheral vasopressors
- Place patient head-up at 45 degrees to reduce aspiration risk and improve laryngeal view
- Consider administering a prokinetic agent (e.g., erythromycin 250 mg IV or metoclopramide 10–20 mg IV) to assist with gastric clearance prior to induction and intubation
- Consider gastric decompression with an NGT to aspirate gastric contents (not contraindicated with variceal bleeding) prior to induction and intubation
- Have two large bore suction devices prepared and working (e.g., DuCanto catheter, meconium aspirator attached to endotracheal tube)
- Avoid positive pressure ventilation during induction prior to intubation if possible; if necessary use a gentle, slow technique with 6–10 breaths/min
- Utilize video laryngoscopy with standard geometry blade (e.g., C-MAC); have one member of the team watch the screen and assist with suction
- Consider using suction assisted laryngoscopy airway decontamination with one suction device placed in esophagus during intubation

NGT, nasogastric tube.

consciousness, continued ongoing hematemesis, inability to adequately control the airway, high risk of continued deterioration, aspiration, and need for further intervention (e.g., GI tamponade device, endoscopy) [10]. If intubation is necessary, patients may require a modified approach with several considerations (Table 2). Importantly, the patient should be resuscitated prior to induction and intubation.

### *2.7. Which decision tools are effective at risk stratifying patients with UGIB?*

Several tools are available seeking to risk stratify patients and potentially identify a subset who may be appropriate for discharge, including the GBS, AIMS65 score, ABC score, Canada–United Kingdom–Adelaide (CANUKA) score, and the Rockall score [9-11,94-112]. A desirable score is one that has high sensitivity and minimizes false negatives. There are two versions of the Rockall score: pre-endoscopy and post-endoscopy [96,97]; however, the pre-endoscopy score is the most relevant for the emergency clinician and incorporates age, shock, and comorbidities (Table 3) [98]. The most commonly used score is the GBS, which has been validated in multiple studies (Table 4). A GBS of ≤1 is over 98% sensitive in predicting low risk UGIB, and multiple studies comparing GBS with other scores suggest GBS is more accurate in determining who is low risk and predicting mortality and need for in-hospital intervention [94,95,98-100,103-105,109-112]. There is a modified version of GBS that removes melena, recent syncope, history of liver disease, and the presence of heart failure, with several studies suggesting similar accuracy between the original and modified versions of GBS [11,110]. The AIMS65 is relatively newer, originally derived in 2011 to predict mortality, and can also be used prior to endoscopy (Table 5) [102-104]. One study suggests AIMS65 may be better at predicting in-hospital mortality, intensive care unit admission, and hospital LOS, while the GBS is better at predicting the need for transfusion

**Table 3**
Rockall score (Pre-endoscopy).

| Component | Value |
|---|---|
| Age | |
| *60–79 years* | 1 |
| ≥80 years | 2 |
| Shock | |
| *Systolic blood pressure ≥ 100 mmHg, heart rate > 100* | 1 |
| *Systolic blood pressure < 100 mg Hg* | 2 |
| Comorbidities | |
| *Any comorbidity except renal/liver failure, malignancy* | 2 |
| *Renal or liver failure, disseminated malignancy* | 3 |

**Table 4**
GBS scoring system.

| Component | Value |
|---|---|
| Heart rate (bpm) | |
| *≥100* | 1 |
| Systolic blood pressure (mm Hg) | |
| *100–109* | 1 |
| *90–99* | 2 |
| *<90* | 3 |
| Blood urea nitrogen (mg/dL) | |
| 18.2–22.3 | 2 |
| *22.4–28* | 3 |
| *28–70* | 4 |
| *>70* | 6 |
| Hemoglobin (g/dL) | |
| *Male 12.0–13.0* | 1 |
| *10.0–11.9* | 3 |
| *<10.0* | 6 |
| *Female 10.0–12.0* | 1 |
| *<10.0* | 6 |
| Other Markers | |
| *Melena* | 1 |
| *Recent syncope* | 2 |
| *History of liver disease* | 2 |
| *Heart failure present* | 2 |

[105]. The ABC score has demonstrated good performance in predicting mortality (Table 6) [101,107]. The most recently evaluated score is the CANUKA scoring system, initially derived in 2019 (Table 7) [106]. A second study evaluating the CANUKA score found those with a score < 4 had no adverse events, and no patient with a score < 6 died [108]. A third study found GBS ≤ 1, modified GBS of 0, and CANUKA ≤2 had high sensitivity in determining low risk, with no patient deaths [95]. A 2016 systematic review evaluating GBS, Rockall, and AIMS65 scoring systems found the GBS score to have better predictive value in determining low risk for 30-day adverse events [109]. Of note, a 2023 meta-analysis comparing risk scores for UGIB included 38 studies evaluating the GBS, clinical Rockall score, CANUKA, AIMS64, and ABC score and found the GBS score with a threshold of ≤1 was the best discriminator in predicting low risk (including mortality; rebleeding; and need for endoscopic, surgical, or radiologic intervention) [112]. Currently, the ACG, ESGE, and ICG suggest using a GBS score of ≤1 over other scores to identify UGIB patients at very low risk of mortality or rebleeding and who may be appropriate for outpatient management [9-11].

Importantly, the clinician should consider other factors and not rely upon these scores in isolation. Patients with severe or recurrent bleeding, hemodynamic instability, significant comorbidities, suspected high risk bleeding sources (e.g., varices, ulcer, Dieulafoy's lesion), severe comorbidities (e.g., end-stage renal disease, heart failure), or inability to follow up should be admitted. However, if these are not present and the patient can be stratified as low risk (e.g., GBS of ≤1), discharge with follow up can be considered [9,10].

## 3. Conclusions

UGIB is associated with significant morbidity and mortality, with most patients admitted. Hematemesis is the most common

**Table 5**
AIMS65 score.

| Component | Value |
|---|---|
| Albumin <3 g/dL | 1 |
| INR > 1.5 | 1 |
| Altered mental status | 1 |
| Systolic blood pressure ≤ 90 mmHg | 1 |
| Age ≥ 65 years | 1 |

**Table 6**
ABC score.

| Component | Value |
|---|---|
| Age (years) | |
| *60–74* | 1 |
| *≥ 75* | 2 |
| ASA Class | |
| *3* | 1 |
| *≥4* | 3 |
| Systolic blood pressure (mm Hg) | |
| *≥100–119* | 1 |
| *≥90–99* | 2 |
| *<90* | 3 |
| Blood urea nitrogen | |
| *≥28* | 1 |
| Albumin | |
| *< 3 mg/dL* | 2 |
| Serum creatinine (mg/dL) | |
| ≥1–1.4 | 1 |
| ≥1.5 | 2 |
| Comorbidities | |
| *Cirrhosis* | 2 |
| *Altered mental status* | 2 |
| *Disseminated malignancy* | 4 |

**Table 7**
CANUKA score.

| Component | Value |
|---|---|
| Age (years) | |
| *50–64* | 1 |
| *≥ 56* | 2 |
| Heart rate (bpm) | |
| *≥100–124* | 1 |
| ≥125 | 2 |
| Systolic blood pressure (mm Hg) | |
| *≥100–119* | 1 |
| *≥90–99* | 2 |
| *<90* | 3 |
| Blood urea nitrogen | |
| *14–27.7* | 1 |
| *28–41.7* | 2 |
| *≥42* | 3 |
| Comorbidities | |
| *Melena* | 1 |
| *Hematemesis* | 1 |
| *Syncope* | 1 |
| *Liver disease* | 2 |
| *Disseminated malignancy* | 2 |

presentation, but patients can present with significant hemodynamic changes. There are a variety of causes, with peptic ulcer disease the most common. NGT lavage is not recommended to confirm the diagnosis. Patients with severe bleeding and hemodynamic instability require blood product transfusion. In patients who are stable, a hemoglobin transfusion threshold of 7 g/dL should be used (8 g/dL in those with myocardial ischemia). Medications that may be used include PPIs, prokinetic agents, and octreotide. Antibiotics should be administered in those with variceal bleeding. Endoscopy is recommended within 24 h for those with non-variceal bleeding for diagnosis and management, though this should be completed sooner in those with variceal bleeding. If endoscopy fails to achieve hemostasis, TAE or surgical intervention may be necessary. Endotracheal intubation may be necessary in select patients but is not recommended routinely. A GBS ≤ 1 suggests the patient is at low risk of adverse events, but risk scores should never replace clinical judgment.

## CRediT authorship contribution statement

**Brit Long:** Visualization, Validation, Resources, Conceptualization, Writing – review & editing, Writing – original draft. **Michael Gottlieb:** Visualization, Validation, Supervision, Resources, Conceptualization, Writing – review & editing.

## Declaration of competing interest

None.

No author has completed a narrative review on UGIB.

The authors of this review will not be submitting a manuscript on UGIB to another journal until AJEM makes a decision to reject or actually publishes (not just accepts) this manuscript.

No AI program was used to construct this review.

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